भारतीय मानक
Indian Standard

IS 1448 [P : 165] : 2018

पेट्रोलियम और उसके उत्पादों के लिए परीक्षण के तरीके

[पी : 165]

चिकनाई तेल के रोल स्थिरता के लिए परीक्षण पद्धति

Methods of Test for Petroleum and its Products

[P : 165]

Test Method for Roll Stability of Lubricating Grease

ICS 75.100

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Methods of Sampling and Test for Petroleum, Petroleum Products, Gaseous Fuels and Lubricants Sectional Committee, PCD 01

FOREWORD

This Indian Standard [P : 165] was adopted by the Bureau of Indian Standards after the draft finalized by the Methods of Sampling and Test for Petroleum, Petroleum Products and Lubricants Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Considerable assistance has been derived from ASTM D 1831 Standard test method for roll stability of greases while preparing this standard. The precision of this test method is not known to have been obtained in accordance with currently accepted guidelines (for example in Committee D-2 research report RR: D02-1007, ‘Manual on determining precision data for ASTM methods on petroleum products and lubricants’).

This method is widely used in various industrial and automotive grease specifications. The results are obtained more quickly with this test method, which operates at somewhat higher shear and rolling conditions. This test method is used in conjunction with IS 1448 [P : 116] ‘Determination of cone penetration of lubricating grease using one quarter and one half scale cone’.

This modified roll stability test method is also very useful in evaluation of long life greases at elevated temperatures, often even above 80°C for 96 h, instead of conventional 2 h room temperature tests. The test results obtained with this method are significant insofar as they can show directional change in consistency that could occur during service, but no accurate correlation between roll stability test results and actual service performance has been established.

The values stated in inch-pound units for the apparatus dimensions are to be regarded as standard; the SI conversions are provided for information only. All other values stated in SI units are standard. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’.

Indian Standard

METHODS OF TEST FOR PETROLEUM AND ITS PRODUCTS

[P : 165]

TEST METHOD FOR ROLL STABILITY OF LUBRICATING GREASE

1 SCOPE

This standard [P : 165] covers determination of the changes in the consistency, as measured by cone penetration, of lubricating greases when worked in the roll stability test apparatus.

2 REFERENCES

The Standards listed below contain provisions which, through reference in text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

Indian Standard	*Title*
1448	Methods of test for petroleum and its products
[P : 60]	Test method for cone penetration of grease
[P : 116]	Test method for cone penetration of grease using one half and one quarter scale cone equipment

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Consistency — Of lubricating grease, the degree of resistance to movement under stress.

NOTE — The term consistency is used some-what synonymously with penetration. Generally, consistency refers to the worked penetration of a grease

3.2 Lubricant — Any material interposed between two surfaces that reduces the friction or wear between them.

3.3 Lubricating Grease — A semi-fluid to solid product of a dispersion of a thickener in a liquid lubricant. The dispersion of the thickener forms a two-phase system and immobilizes the liquid lubricant by surface tension and other physical forces. Other ingredients imparting special properties are often included.

3.4 Penetration of Lubricating Grease — The depth that the standard cone, when released to fall under its own weight for 5 s, enters the sample. (*see* IS 1448 [P : 60])

3.5 Working of Lubricating Grease — The subjection of a sample to the shearing action of the standard grease worker.

3.5.1 *Worked Penetration of Lubricating Grease* — The penetration at 25°C (77°F), without delay, of a sample after 60 double strokes in a standard grease worker.

3.6 Roll Stability of Lubricating Grease — The change in consistency of a sample after a specified amount of working in a test apparatus utilizing a weighted roller inside a rotating cylinder.

3.7 Thickener in Lubricating Grease — A substance composed of finely divided particles dispersed in a liquid lubricant to form the product's structure. The thickener can be fibers (such as various metallic soaps) or plates or spheres (such as certain non-soap thickeners) which are insoluble or, at the most, only very slightly soluble in the liquid lubricant. The general requirements are that the solid particles be extremely small, uniformly dispersed, and capable of forming a relatively stable, gel-like structure with the liquid lubricant.

4 PRINCIPLE OF THE TEST METHOD

Using the test method IS 1448 [P : 116], cone penetration of an approximately 50 g aliquot of lubricating grease is determined. The grease is then subjected to low shear at 20 to 35°C (68 to 95°F) for 2 h ± 5 min in a standard roll stability apparatus, before the cone penetration is again measured. The difference between the cone penetration before working and the cone penetration after working is used as a measure of the effect of low shear working on grease consistency.

5 APPARATUS

5.1 Roll Stability Test Apparatus

Capable of rotating a steel cylinder and 5 ± 0.05 kg roller weight at a rolling speed of 165 ± 15 rpm. One such example of a suitable apparatus is shown in Fig. 1.

5.2 One-quarter or One-half Scale Cone and Shaft

With Worker, as described in IS 1448 [P : 116].

6 PROCEDURE

Determine the worked penetration in accordance with IS 1448 [P : 116]. Transfer 50 g of the unworked grease to the test cylinder. Distribute the grease uniformly on the inside wall of the cylinder with a spatula. Place the weighted roll in the cylinder and tighten the cap. Mount the cylinder in position, start the machine, and record the time and room temperature which should be limited to 20 to 35°C (68 to 95°F). If the cylinder is enclosed within a cabinet, the temperature around the cylinder shall be maintained at 20 to 35°C (68 to 95°F). After rolling for 2 h ± 5 min, remove the grease from the cylinder promptly and proceed with the requirements of worked penetration in test method [P : 116]. Record the worked penetration. After transferring the grease to the worker, clean the roll stability test apparatus by wiping with clean cloth or tissue. Convert the fractional scale penetration values determined (before and after rolling) into the equivalent full scale cone penetration values using the appropriate equations described in [P : 116].

7 CALCULATION

Calculate the change in consistency of the sample as follows:

$$\text{Penetration change } P2 - P1 \quad (1)$$

where,

P2 = final full-scale penetration reading, and

P1 = initial full-scale penetration reading.

NOTE — Penetration readings are measured in tenths of a millimetre. A negative penetration change indicates hardening of a grease while a positive penetration change indicates softening.

8 REPORT

The value calculated as in **7** is reported as the change in consistency.

9 PRECISION AND BIAS

9.1 The precision of the test method (*see* Note) as determined by statistical examination of inter laboratory results is as follows:

NOTE —The criteria for repeatability and reproducibility are based on the spread in the numbers after conversion to the full-scale units described in [P : 116]. Precision of this test method

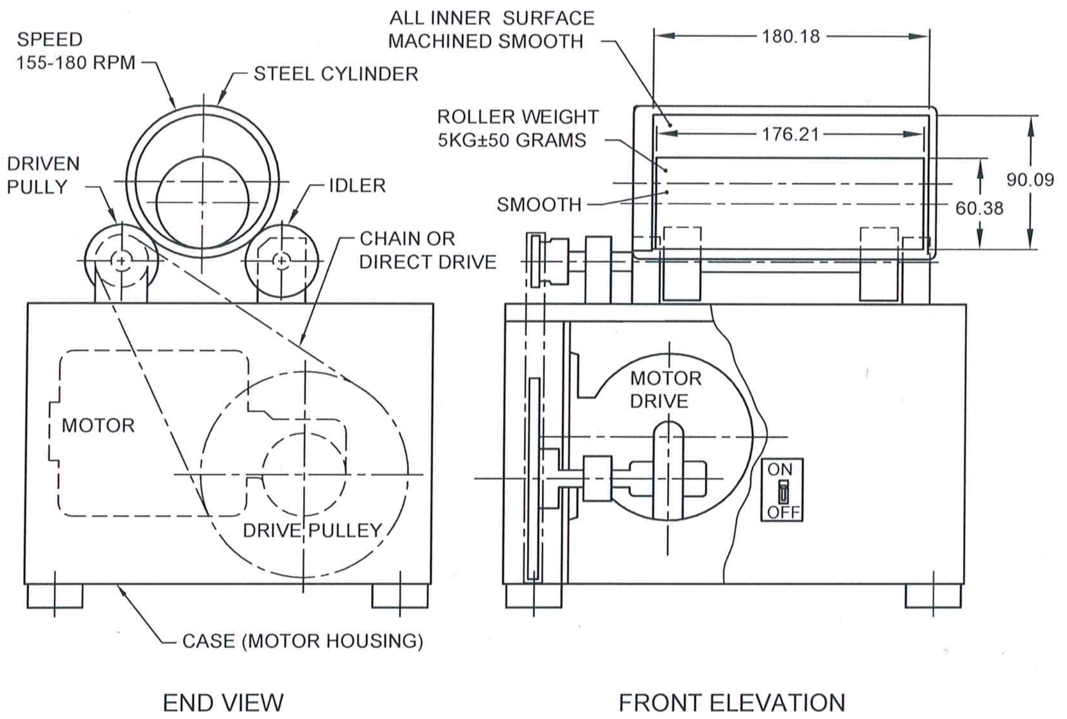

FIG. 1 ROLL STABILITY TESTER

was established using the one-quarter scale equipment, but based on the precision values in [P : 116], the precision of this test should be at least as good or better using the one-half scale equipment.

9.1.1 *Repeatability*

The difference between two test results, obtained by the same operator with the same apparatus under constant operating conditions on identical test material, would in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in twenty:

Range of Sample	*Repeatability*
NLGI Consistency Nos. 1 and 2	11 penetration units — tenths of a millimetre

9.1.2 *Reproducibility*

The difference between two single and independent results obtained by different operators working in different laboratories on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in twenty:

Range of Sample	*Reproducibility*
NLGI Consistency Nos. 1 and 2	45 penetration units — tenths of a millimeter

9.2 Bias

The procedure in this test method has no bias because the value of the change in penetration can be defined only in terms of a test method.

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Amendments Issued Since Publication

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